

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES
FOURTH SERIES

VOL. XVIII, No. 2, pp. 29-43, 6 text figures JANUARY 29, 1929

II

A NEW BIRD FAMILY (GEOSPIZIDÆ) FROM THE
GALAPAGOS ISLANDS

BY

HARRY S. SWARTH

Curator, Department of Ornithology and Mammalogy

The expedition that was sent by the California Academy of Sciences to the Galapagos Islands during 1905 and 1906, secured a collection of birds numbering over 8000 specimens. Gifford (1913) reported upon the species (mostly water birds) from the Columbiformes to the Pelecaniformes (as entered in Sharpe's "Hand-List of Birds"), while Loomis (1918) covered the Tubinares of the expedition in his "Review of the albatrosses, petrels, and diving petrels." The remainder of the collection (nearly 6000 skins), comprising all of the land birds except the one species of pigeon, remained untouched until the middle of 1927, when I began their study. A large part of the land-bird population of the Galapagos is comprised in the "ground finches" of the genera *Geospiza*, *Cactospiza*, and *Camarhynchus* (with which must be included *Pinaroloxias*, of Cocos Island), and the "creepers" (*Certhidea*), and of these there are more than 4000 specimens at hand. A preliminary survey of the collection sufficed to show that the extensive series of specimens available would in many cases shed new light upon unsettled questions, and would probably necessitate the description of some new forms. It became evident,

January 29, 1929

too, that there were specimens in the collection representing undescribed species that were of interest and importance beyond that attaching to mere "newness" alone. The specimens referred to are unfortunately few in number, comprising four skins representing three different forms, but they are all so trenchantly different from any bird previously discovered upon the Galapagos that their peculiar features may be discussed without considering the possibility of their representing some previously unknown phase of an already described species.

As regards most of the slightly differentiated and hitherto unrecognized island races that for one reason or another it may seem desirable to distinguish by name, the publication of their descriptions can await completion of the entire study. But the appearance of the exceptional birds above referred to suggests some questions that it seems to me well to have stated at once, for discussion, and, on my part, for consequent correction if I have read my facts wrongly.

The two most conspicuous groups of Galapagos land birds, those most abundant in species and individuals, have of late years been generally referred to two continental families. The so-called "ground finches," referred to one genus (*Geospiza*) or to several, according to the views of different students, are regarded (and always have been, heretofore) as belonging to the Fringillidæ (finches), as, curiously enough, has been also the Cocos Island *Pinaroloxias inornata*. The "creepers" (*Certhidea*), after tentative assignment to the Fringillidæ and Cœrebidæ, have lately been regarded as belonging with the Mniotiltidæ (American wood warblers), largely as the result of studies by Lucas (1894) and Ridgway (1902).

My own conclusions are that the "ground finches" of the Galapagos Islands and Cocos Island (*Geospiza*, etc.) are *not* of the Fringillidæ, that the "creepers" (*Certhidea*) are *not* of the Mniotiltidæ, but that these two groups are very closely related to each other (far more nearly than either is to any continental family), and that the two together should be regarded as forming one family, a family that is confined to the Galapagos Archipelago and Cocos Island. This family will assume the name Geospizidæ, after *Geospiza* (Gould, 1837, p. 5), the first genus described in these groups.

This opinion is contrary to most of those previously held by others, but the facts now available all point so unreservedly in one direction that I feel no hesitation in arriving at the conclusion expressed. The characters of the several newly discovered forms that are here given names supply so unequivocally just the evidence needed to corroborate certain tentative conclusions that can be arrived at from many features found in common among the diverse species of this group, as to make the joining of these species under one family name a course that it seems to me is well-nigh inevitable.

The family Geospizidæ can not be defined to entire satisfaction at present, but the group may be roughly characterized, on the basis of external features, as follows: An assemblage of Passerine forms of small and medium size (wing 48.0 to 95.0 mm.). Wing rather short and rounded; tail rounded, much shorter than wing. Tarsus and toes long, outstretched feet extending beyond tip of tail. Rictal bristles obsolete. Bill extremely variable in relative length, depth, and width. Feathers on lower back and rump long, dense, and fluffy. Coloration unlike in adult male and female (except in *Cactospiza* and some forms of *Certhidea*), but with great variability on different islands in the number of males of any given form that ever attain "adult" plumage. Color of bill varies seasonally and with age, being black or dusky in adults of both sexes during the breeding season, yellowish or otherwise light colored in adults at other seasons and in the young. Confined to the Galapagos Islands and Cocos Island.

As a necessary preliminary to further discussion, names may here be given to the several newly discovered species to which reference is made. First, it will be seen that I am reviving here the name *Cactospiza*, proposed by Ridgway (1896, p. 546) as a subgenus (type, *Cactornis pallida* Sclater & Salvin), but, as it seems to me, deserving of full generic recognition. The species of *Cactospiza* are distinguished by relatively long, slender bill, with the line of the gonys slightly convex. In the slender-billed species of *Geospiza* the line of the gonys is straight or slightly concave. *Cactospiza* is further distinguished by having no black in the plumage in any stage, and in that the sexes are alike in every respect. In the other genera of Geospizidæ the sexes are unlike in every case except

in some forms of *Certhidea*. The genus *Cactospiza* will include *pallida* in its several subspecific forms, *heliobates*, and *giffordi*.

Intergradation between *Certhidea* and *Cactospiza* is definitely shown in *Cactospiza giffordi*, but *Cactospiza* can not be said to occupy middle ground between *Certhidea* and *Camarhynchus*. To place the species *pallida*, *heliobates*, and *giffordi* in the genus *Camarhynchus* would, therefore, in the light of their recognized leaning toward *Certhidea*, give a false idea of relationships, an impression that can be avoided by the generic segregation of these several forms.

*Cactospiza giffordi**, new species

Type: Male adult, No. 7522, Mus. Calif. Acad. Sci., collected by E. W. Gifford (orig. No. 1900), January 18, 1906, on **Indefatigable Island, Galapagos Archipelago.**

Characters: Evidently nearly related to the *pallida-heliobates* group, but much smaller and with more slender bill than any other described form in that group.

Description of type and only known specimen: In rather worn plumage. Above brownish, about as in the darker examples of *pallida*, with an olivaceous tinge. Top of head slightly darker than dorsum. A poorly defined superciliary stripe of yellowish from nostril to posterior corner of eye. Sides of head dirty brownish; a poorly defined grayish spot on lower eyelid. Remiges and rectrices dusky, with narrow edgings of greenish olive; under wing coverts strongly tinged with yellow. Under parts of body and lower tail coverts plain, unstreaked; whitish, strongly tinged with yellow. Sides of breast and flanks grayish brown. On chin and throat irregular flecks of the tawny color characteristic of the throat color in species of *Certhidea*. Bill black; feet dusky. "Testicles very large" (collector's notation on label). For measurements see table, page 42.

*Named for Edward Winslow Gifford, Curator of the Anthropological Museum, University of California, who did a large proportion of the ornithological field work upon the California Academy of Sciences expedition of 1905-1906 to the Galapagos Islands, and who has published reports upon some of the birds collected.

Camarhynchus conjunctus, new species

Type: Male adult, No. 7713, Mus. Calif. Acad. Sci., collected by R. H. Beck, February 28, 1906, on Charles Island, Galapagos Archipelago.

Characters: Intermediate in certain outstanding features between *Camarhynchus* and *Certhidea*. In measurements and in bulk lies between the maximum reached in *Certhidea* and the minimum in other species of *Camarhynchus*. The bill in particular is intermediate in shape and size between those of typical *Certhidea* and typical *Camarhynchus*.

Description of type: In fresh, unworn plumage. Upper parts generally dull olive green, feathers of pileum with dusky centers, giving a blackish appearance to top of head. Sides of head like back; eyelids and faint superciliary line pale yellowish. Remiges and rectrices dusky, edged with olivaceous. Greater and middle wing coverts like back, narrowly edged with yellowish, producing two poorly defined wing bars. Below greenish yellow, paler than back. Sides of breast and flanks, and lower tail coverts, tinged with brownish; middle of belly pale yellowish. Chin and throat indistinctly marked with tawny of the same shade as is characteristic of the throat patch in species of *Certhidea*. Feathers of throat and upper breast black-centered, producing a streaked appearance, the general effect of which is of poorly defined black lines surrounding a rather nebulous tawny throat patch. "Bill black; legs dark brown; testes large" (collector's notation on label).

A second specimen, also an adult male, collected by Beck on the same day, is in rather more worn plumage. Color of upper parts is about as in the type, but below it is paler colored, more whitish and with less of the greenish hue. The black streaks on the breast are obscurely indicated, and the tawny on the throat is washed out and but faintly discernible. The rufous is more widespread than on the type, though, spreading to the sides of the head and invading even the superciliary line. "Bill black; iris dark brown; legs dark brown; testes large." For measurements see table, page 42.

***Camarhynchus aureus*, new species**

Type: Male adult, No. 8121, Mus. Calif. Acad. Sci., collected by E. W. Gifford (orig. No. 1944), January 25, 1906, on Chatham Island, Galapagos Archipelago.

Characters: Generally similar to *Camarhynchus conjunctus* but with slightly heavier bill and more uniform coloration.

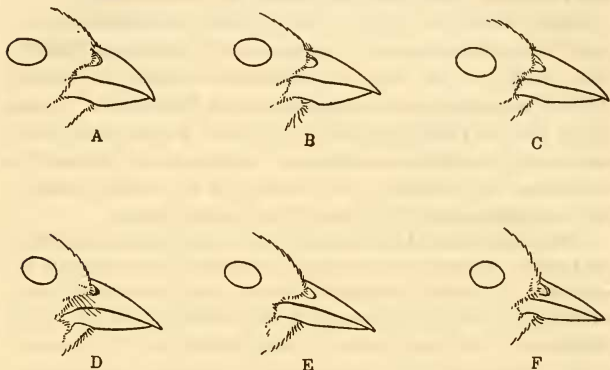
Description of type and only known specimen: In rather worn plumage. Upper parts faded, but evidently originally dull olive green. Remiges and rectrices dusky, narrowly edged with olivaceous. Closed wings, including coverts, uniform with back. There are faint indications of light tips to the greater and middle wing coverts, and in fresh plumage there may have been discernible wing bars. Below, from bill to and including lower tail coverts, almost uniformly pale yellow, broken only by a slightly mottled appearance on the breast, where the blackish bases of the feathers show through, and with sides of breast and flanks slightly darker. The yellow of the under surface spreads over the sides of neck and face, over cheeks and ear coverts, to meet a broad yellow superciliary line that extends from bill and forehead back to a point well behind the eye. Bill blackish, with edges of upper and tip of lower mandible slightly paler. Feet and legs blackish. For measurements see table, page 42.

These two new forms from Charles and Chatham islands, *conjunctus* and *aureus*, appear to be closely related, and it might be that adequate series of the two would show plumage variation that would bring them even closer together than is indicated by the scanty material now available. The differences apparent in the skins at hand, however, especially as two rather widely separated islands are represented, are such as to justify the present separation of the two forms.

In these two puzzling species (*conjunctus* and *aureus*) resemblance to *Certhidea* lies in general size and form and in certain peculiarities of markings. Resemblance to *Camarhynchus* appears in the more finch-like bill and in general coloration, which in *conjunctus* and *aureus* is very close to the unstreaked "immature" plumage of *Camarhynchus prothemelas*. There may be significance in the fact that *C. prothemelas*

salvini from Chatham Island is strongly tinged with yellow, just as is the one specimen of *C. aureus* from that island.

It is a debatable point as to whether *conjunctus* and *aureus* should not be segregated together in a separate genus. Such a genus would have to be based upon the combination of certain characters, some of which in other species occur in



Drawing by Mrs. Frieda Abernathy

Species of *Camarhynchus* and *Certhidea* showing intergradation in bill structure between the two genera. Slightly larger than natural size.

- A. *Camarhynchus prothemelas prothemelas* (No. 7756).
- B. *Camarhynchus aureus* (No. 8121).
- C. *Camarhynchus conjunctus* (No. 7713).
- D. *Certhidea ridgwayi* ? (No. 4862).
- E. *Certhidea ridgwayi* (No. 4643).
- F. *Certhidea olivacea* (No. 4538).

Camarhynchus, some in *Certhidea*, and the genera already described in the Geospizidæ are so nearly arbitrary in their nature that it seems to me undesirable to add another genus of uncertain definition.

In Gould's (1837) first account of the Galapagos "finches," *Geospiza* is described as a new genus and *Cactornis*, *Camarhynchus*, and *Certhidea* as subgenera under *Geospiza*, inferentially as of the Fringillidæ, as they are spoken of collectively as "ground finches." Of *Certhidea* the comment is made (in

the third person, as written presumably by the secretary of the Society) "that although he confidently believed that it should also be referred to the same group with the three former, yet in its slighter form and weaker bill it has so much the appearance of a member of the *Sylviadæ*, that he would by no means insist upon the above view being adopted until the matter shall have been more fully investigated."

Sclater & Salvin (1873, p. 16) placed *Certhidea* in the family Cœrebidæ, whence it was removed by Ridgway (1896), who, partly on the basis of anatomical studies by Lucas (1894), considered it as belonging to the *Mniotiltidæ*, a conviction that he (1902) has since repeated. Lucas found various points of difference between *Certhidea* and species of Cœrebidæ, but affinity with *Mniotiltidæ* is founded mainly upon resemblances in the bones of the palatal region.

Then Snodgrass (1903) published a most important paper, the results of careful comparative study of the anatomy of *Geospiza*, *Cocornis* (= *Pinaroloxias*), and *Certhidea*, with descriptive matter and figures that merit careful scrutiny. His conclusions, reached through examination of the internal anatomy of these birds, are essentially the same as those to which I have been led by comparison of external features, but he did not push his argument to its logical outcome. His closing remarks on the structure of the skull read as follows: "All that the writer here intends is simply to call attention to the fact that there is a gradation in the skull characters of these three genera, progressing by almost equal steps from one extreme to the other. If any phylogenetic theory can be based on this fact then the classification of the three genera accepted at present cannot be correct, for *Certhidia* is regarded as a member of the *Mniotiltidæ* and *Geospiza* and *Cocornis* are placed in the *Fringillidæ*. The *Geospizæ* as birds have certainly a most *Fringillid* appearance. The same, however, cannot be so positively asserted concerning the skull of even the least modified species."

The alternatives, apparently regarded as inevitable, of placing these diverse groups either all in the *Fringillidæ* or all in the *Mniotiltidæ*, were so baffling as to cause Snodgrass to stop with the presentation of his really conclusive argument, and to refrain from proposing any change from the formerly

accepted but obviously false arrangement. I do not know that anyone has followed up the matter since.

Now as to externals. There are of course superficial features in which *Certhidea* resembles species of Mniotiltidæ and of Cœrebidæ; and the obvious dissimilarities between *Certhidea* and some forms of *Geospiza* and *Camarhynchus* are such as at first sight to render apparently ridiculous any assertion of close relationship between those groups. Let us see, however, what external features they have in common. Despite considerable differences in size, the largest *Geospiza* at one extreme, *Certhidea* at the other, and the host of intermediate forms between, they are all very similar in proportions. They all have rather short, rounded wings, rather short tail, and long legs (toes in every case reaching beyond tip of tail in the prepared skin); Ridgway's (1901, 1902) diagnoses of the genera *Geospiza*, *Camarhynchus*, and *Certhidea* read surprisingly alike in describing the details of those parts. The proportions described, too, are not commonly found, if found at all, in the Mniotiltidæ or in American species of Fringillidæ. Then, there is a peculiar texture of plumage that is common to the several Galapagos forms, something well nigh impossible to describe but obvious to any one handling specimens, and accompanying this there is a peculiarly thick growth of long, loose feathers on the lower back and rump of all the species concerned, such as I do not find at least in North American birds of the families to which they have been relegated.

The color of the bill in *Geospiza* and related genera, and in *Certhidea*, sometimes black, sometimes light colored, has been described as an irresponsibly variable feature, not to be correlated with anything else. Without going into details, which are voluminous and complicated, it may suffice here to say that the observed facts justify the conclusion that in all these birds, *Geospiza* and *Certhidea* alike, the bill in adults of both sexes is black during the breeding season, light colored at other seasons, and light colored in the young.

In *Geospiza* a uniformly or nearly uniformly black plumage in the male, in *Camarhynchus* a black-headed plumage in the male, in *Certhidea* a chestnut-throated plumage in the male, are regarded as the most "perfect" or "fully mature" condition of plumage. In each of these groups, taking any one

form on the several islands on which it may occur, the "perfect" plumage (black, black head, or chestnut throat, as the case may be) will be found in varying abundance on different islands, numerous (perhaps always present) on one, scarce on another, unknown on a third. This is a peculiar phenomenon that certainly seems like another link in the chain holding these diverse forms together.

In some forms of *Certhidea* the juvenal plumage is plain colored and unmarked below, as in the adult, but in the young of *Certhidea ridgwayi* the lower parts are heavily streaked with dusky, just as in young of species of *Camarhynchus*.

Nests and eggs of *Certhidea* have been described often with reservations that are significant in the light of the close relationship that I believe is now demonstrated to exist between *Certhidea* and *Camarhynchus*. Snodgrass & Heller (1904, p. 349) make the following statement: "We shot a female of *C. olivacea olivacea* at Iguana Cove, Albemarle, from a nest containing three eggs. The nest was exactly like that of *Geospiza fuliginosa* and the eggs were identical in size and coloration with those of the same species. . . Hence, since we have no other examples we hesitate in ascribing this nest to *Certhidea*." There are other statements in literature (see Rothschild & Hartert, 1902, p. 385) likewise bearing evidence as to the similarity in nesting habits of the two groups of birds. Gifford (1919, p. 242) says of *Pinaroloxias inornata*: "This species combines the habits of a ground-feeding finch with those of a tree-feeding warbler." *Pinaroloxias*, further, combines the bill structure of *Certhidea* with the coloration of *Geospiza*.

Now, added to these suggestive characters found in common in *Geospiza* and *Certhidea*, comes the discovery of the several species above described, which appear to be connecting links between the two groups. It will be noted that, curiously, there are two separate points of contact between the "creepers" and the "ground finches." At one point, through *Camarhynchus conjunctus*, there is what appears to be close connection between *Certhidea* and the group comprised in the black-headed *Camarhynchus*; at the second, through *Cactospiza giffordi*, connection between *Certhidea* and the plain colored species of *Cactospiza*. *Camarhynchus conjunctus* and *C. aureus* in general appearance are closely similar to *C. prosth-*

melas, so much so that the type specimen of *C. aureus* was entered as *prosthemelas* in the field note book of the collector. *Cactospiza giffordi*, despite its small size, is obviously like *C. pallida*. Yet in *conjunctus* and *giffordi* both there is most unexpectedly displayed traces of the characteristically Certhidean cinnamon-tawny throat patch. As regards the type specimen of *C. giffordi*, it is suggestive that the note book of the collector, E. W. Gifford, contains the following comment: "I obtained one bird at about 350 feet elevation which seemed to be intermediate between *Certhidea* and *Geospiza pallida*. It was feeding like a *Geospiza pallida* on a branch of a tree."

If further evidence in the shape of debatable specimens were needed it is found in a bird from Charles Island (No. 4862, Mus. Calif. Acad. Sci., female [immature?], May 29, 1906. See fig. D, p. 35.) This specimen is like comparable examples of *Certhidea ridgwayi* of Charles Island in color and plumage, but the bill (not a variable feature in *Certhidea*) is larger than in that species, being as heavy as, and a little longer than, in *Camarhynchus conjunctus* of the same island (see table of measurements). After careful study I do not know whether this bird is an example of *Camarhynchus conjunctus* (of which plumage stages and amount of variation are unknown) or of *Certhidea ridgwayi*. In other words, here is a specimen which I find myself unable to allocate, whether to the Fringilidæ or the Mniotiltidæ, as these families were formerly defined among Galapagos birds.

Both Rothschild & Hartert (1899) and Snodgrass & Heller (1904) dissent from Ridgway's (1896, 1901) division of the "ground finches" into the several genera, *Geospiza*, *Platyspiza*, and *Camarhynchus*, claiming that intergradation of one sort or another necessitates the grouping of the whole aggregation under one generic name, *Geospiza*. The intermediates here described demonstrate further, pretty clearly it seems to me, the impossibility of drawing a line, or of expressing a clear definition of characters, dividing those genera from *Certhidea*. Logically, according to the standards adopted by the authors cited above as opposing Ridgway's treatment, all of these diverse forms, from the enormously large-billed *Geospiza magnirostris* down to the most delicate *Certhidea*, should be placed in the one genus, *Geospiza*. Furthermore, I believe that it would be possible, on the criterion of individual vari-

ation producing overlapping of characters between forms on different islands, to indicate a line of slightly differentiated subspecies under one specific name, that would include most of the described forms of the several genera, and that would extend through the extremes of bill structure and of color characters throughout the genera *Geospiza*, *Camarhynchus*, and *Certhidea*. This statement is novel only in the inclusion of *Certhidea* in the closely linked chain of forms, for Ridgway long ago made precisely the same assertion regarding *Geospiza*. In upholding the recognition of slightly differentiated local forms he says: "No other course, indeed, is practicable; for were 'lumping' once begun there could be no end to it, unless purely arbitrary limits were given to the species recognized, and if followed to a logical conclusion might easily end in the recognition of a single variable species, equivalent in its limits to the genus." (Ridgway, 1896, p. 468.)

I feel, myself, that however logical and consistent it may be demonstrated to be to lump genera in this long list of diverse forms (fifty or more in number), it would not be desirable to do so. The course that I, personally, prefer to follow, is, first grouping the "finches" and "creepers" alike under the one family, Geospizidæ, to recognize at least the genera *Geospiza*, *Cactospiza*, *Camarhynchus*, and *Certhidea*. It will be admittedly impossible to formulate entirely satisfactory definitions of these genera, but their recognition will afford convenient lines of demarcation between sections of a long list of species otherwise too unwieldy for satisfactory treatment. To group all of these diverse forms under one generic name would, it seems to me, defeat the purpose of nomenclature of giving us convenient handles to grasp. To recognize the genera indicated is admittedly indefensible on grounds of logic and consistency, and it will cause grief and indignation in the compiler of books and the arranger of "keys" for identification. It will, however, suit the convenience of whomever wishes to discuss in speech or writing the birds and the problems involved, and that, to my notion, should be regarded as an important function of our nomenclature.

Indication of relationships in nomenclature is of first importance, perhaps, but all of the known facts in the relationships of these birds can not be expressed in their names. To divide the Geospizidæ into as many genera as I propose to do

may give an exaggerated impression of the taxonomic remoteness of some species, but to lump them under a lesser number would assuredly give an even more erroneous impression of close connection between what are really distantly related forms.

I feel that common family relationship of *Geospiza*, *Cactospiza*, *Camarhynchus*, *Pinaroloxias* and *Certhidea* is demonstrated beyond question, but the further problem as to the closest continental relative of the family Geospizidæ is not so easily settled. *Certhidea* is sufficiently unlike any of the Fringillidæ, and *Geospiza* and *Camarhynchus* sufficiently unlike any of the Mniotiltidæ, to debar either of those groups from consideration as having supplied the immediate ancestor of the Geospizidæ. The general situation is apparently much the same as we find in the Drepanididæ of the Hawaiian Islands. In each case there has been wide divergence in bill structure among closely related species, and in the Hawaiian Islands, too, birds with sparrow-like bills were at first relegated to the family Fringillidæ. Only after hot discussion were these apparent "finches" conceded to be Drepanids and listed alongside their slender-billed relatives.

On the Hawaiian Islands species are mostly sharply differentiated, while on the Galapagos Islands, where we may be viewing results after a lesser period of isolation, we are troubled with innumerable intermediate stages. Strangely enough our strongest first feeling toward the existence of these equivocal races and individuals is not one of gratitude for light shed upon relationships, but of resentment at the havoc they create among our carefully ordered schemes of classification, and at the breaches they make between supposedly separated compartments in which we strive to arrange species and higher groups. In the Geospizidæ of the Galapagos (as in the Drepanididæ of the Hawaiian Islands) I think that we must realize that we are contemplating a group of birds that has been isolated on its island home since a remote period of time, and that has developed such distinctive group characters of its own as to have made it well nigh impossible now to recognize the nearest collateral mainland stock, if in fact there is today a corresponding terminal to a parallel line of descent upon the neighboring continent.

TABLE OF MEASUREMENTS IN MILLIMETERS

C.A.S. No.	Sex Age	Species	Locality	Date	Wing	Tail	Culmen	Gonyx	Depth of bill at base	Width of bill at base	Tarsus	Middle toe with claw
7522 ¹	♂ ad.	<i>Cactospiza giffordi</i>	Indefatigable Id.	Jan. 18, 1906	64.0	41.5	13.5	8.2	6.5	5.0	22.5	17.0
8121 ¹	♂ ad.	<i>Camarhynchus aureus</i>	Chatham Id.....	Jan. 25, 1906	58.0	35.0	9.0	6.0	5.5	5.5	21.0	16.5
7713 ¹	♂ ad.	<i>Camarhynchus conjunctus</i>	Charles Id.....	Feb. 28, 1906	59.0	40.0	10.0	6.2	5.2	5.0	20.0	15.0
7714	♂ ad.	<i>Camarhynchus conjunctus</i>	Charles Id.....	Feb. 28, 1906	58.2	38.5	9.5	6.0	5.8	5.0	21.0	17.0
4862	♀ (im?)	<i>Certhidea ridgwayi?</i>	Charles Id.....	May 29, 1906	54.5	39.5	10.5	6.0	5.2	5.0	19.0	15.0

¹Type

LITERATURE CITED

Gifford, E. W.

1913. The birds of the Galapagos Islands, with observations on the birds of Cocos and Clipperton islands (Columbiformes to Pelecaniformes). Expedition of the California Academy of Sciences to the Galapagos Islands, 1905-1906. VIII. Proc. Calif. Acad. Sci., Fourth Ser., II, pt. 1, August 11, 1913, pp. 1-132, pls. 1-7.

1919. Field notes on the land birds of the Galapagos Islands and of Cocos Island, Costa Rica. Expedition of the California Academy of Sciences to the Galapagos Islands, 1905-1906. XIII. Proc. Calif. Acad. Sci., Fourth Ser., II, pt. II, June 16, 1919, pp. 189-258.

Gould, J.

1837. [Remarks on a group of ground finches from Mr. Darwin's collection, with descriptions of new species.] Proc. Zool. Soc. London, pt. V, pp. 4-7.

Loomis, L. M.

1918. A review of the albatrosses, petrels, and diving petrels. Expedition of the California Academy of Sciences to the Galapagos Islands, 1905-1906. XII. Proc. Calif. Acad. Sci., Fourth Ser., II, pt. II, No. 12, April 22, pp. 1-187, pls. 1-17.

Lucas, F. A.

1894. Notes on the anatomy and affinities of the Cœrebidæ and other American birds. Proc. U. S. Nat. Mus., XVII, pp. 299-312, 13 text figs.

Ridgway, R.

1896. Birds of the Galapagos Archipelago. Proc. U. S. Nat. Mus., XIX, pp. 459-670, pls. LVI-LVII, many figs. in text.

1901. The birds of North and Middle America. U. S. Nat. Mus., Bull. 50, part 1, XXX + 715 pp., 20 pls.

1902. *Idem*, part II, XX + 834 pp., 22 pls.

Rothschild, W., and Hartert, E.

1899. A review of the ornithology of the Galapagos Islands. With notes on the Webster-Harris Expedition. Novit. Zool., VI, pp. 85-205, pls. V-VI, many text figs.

1902. Further notes on the fauna of the Galapagos Islands. Notes on the birds. Novit. Zool., IX, pp. 381-418, pl. X, 2 text figs.

Sclater, P. L., and Salvin, O.

1873. Nomenclator avium neotropicalium.
London. Pp. i-viii + 1-163.

Snodgrass, R. E.

1903. Notes on the anatomy of *Geospiza*, *Cocornis*, and *Certhidia*. Auk, XX, pp. 402-417, pls. XVII-XX.

Snodgrass, R. E., and Heller, E.

1904. Papers from the Hopkins-Stanford Galapagos Expedition, 1898-1899. XVI. Birds. Proc. Wash. Acad. Sci., V, pp. 231-372.